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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/047,556
Filing Date: October 23, 2001
Appellant(s): KLEIN ET AL.

Gerald E. Hespos
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 16 July 2007 appealing from the Office action mailed 21 July 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

A substantially correct copy of appealed claim 1 appears on page 13 of the Appendix to the appellant's brief. The minor errors are as follows: "a" in line 19 of claim 1 should probably be "of" (see line 20 of claim 1 in amendment filed 8 May 2006).

(8) Evidence Relied Upon

3,956,654	GLEASON	5-1976
6,011,265	SAULI	1-2000

6,429,578 DANIELSSON *et al.* 8-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

<u>Issue A:</u> *Claims 1, 2, 5, 6, 8-10, 13-15, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Danielsson et al. (US 6,429,578) in view of Gleason (US 3,956,654).*

In regard to claims **1**, **2**, **8**, **9**, and **15**, Danielsson *et al.* disclose (Figs. 2a, 2b, 3, 7a, 7b, and 9) a detector for detecting electrically neutral particles, comprising:

(a) a detector housing (column 7, lines 2-14) which at least in certain regions is filled with a counting gas,

(b) a multiplicity of the converter devices (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d) arranged in cascade form in the detector housing for generating conversion products (*e.g.*, electrons; column 7, lines 49-54) as a result of the absorption of the neutral particles (*e.g.*, neutrons; column 13, lines 9-11) which are to be detected, the conversion products generating electrically charged particles (*e.g.*, electrons; column 7, lines 54-56) in the counting gas, each of said converter device (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d) comprising an insulator layer (204, 706, 710) having first and second surfaces, a first conductive layer (206, 704) and a second conductive layer (208, 712) disposed respectively on the first and second surfaces of the insulator layer (204, 706, 710) such that the first (206, 704) and second (208, 712) conductive layers are electrically insulated from one another by the insulator layer (204, 706, 710), at least one converter

layer (*e.g.*, 708), each said converter device (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d) has a multiplicity of passages for the electrically charged particles (column 6, lines 14-16), the first conductive layer (206, 704) and the second conductive layer (208, 712) are electrically connected to a device for generating a converter field, wherein the insulator layer (204, 706, 710) in each of said converter device (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d) is the only insulator layer thereof (*e.g.*, 204).

(c) at least one readout device (314, 914) for detecting (column 8, lines 36-50) the electrically charged particles; and

(d) at least one electrical drift field device (200, 304a, 304b, 304c, 304d, 304e, 306, 700, 904a, 904b, 904c, 904d, 904e, 906) for generating an electrical drift field for the electrically charged particles in at least a region of the volume of the counting gas in such a manner that at least some of the electrically charged particles drift (*i.e.,* charge collect; column 8, lines 25-35) toward the readout device (314, 914), the converter device (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d) being of charge-transparent design (*i.e.*, perforated; column 7, lines 39-47) and being arranged in the detector housing in such a manner that the drift field passes through at least part of each said converter device (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d).

The detector of Danielsson *et al.* lacks an explicit description that the at least one converter layer is arranged on at least one of the first conductive layer and the second conductive layer to define an outermost part of each said converter device, the

converter layer (*e.g.*, neutron converter layer) being formed of a material (*e.g.*, at least one of lithium-6, boron-10, gadolinium-155, gadolinium-157 and uranium-235) different than the conductive layer on which the converter layer is arranged. However, Danielsson *et al.* also disclose (Figs. 7a and 7b; claims 11 and 18) that at least one converter layer (*e.g.*, 708) can be integrated into a GEM structure (202, 704, 706, 710, 712) with first and second conductive layers comprising copper (column 6, lines 31-34), and that the detector may be optimized by a skilled man for other types of particles such as neutrons (column 13, lines 9-11). Since Danielsson *et al.* do not disclose and/or require a specific neutron converter layer, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified neutron converter layer of Danielsson *et al.* as any one of the known conventional neutron converter layers that would not require further description. Further, Gleason teaches (column 1, lines 9-36) that boron-10 is a widely used converter layer for detecting neutrons. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to arrange boron-10 on the copper conductive layer in the detector of Danielsson *et al.*, in order to detect neutrons.

In regard to claim **5** which is dependent on claim 1, Danielsson *et al.* also disclose (Figs. 3 and 9) that a region of each said converter device (202, 302a, 302b, 302c, 302d, 700, 902a, 902b, 902c, 902d) which is active in the conversion is arranged substantially perpendicularly in the drift field.

In regard to claim **6** which is dependent on claim 1, Danielsson *et al.* also disclose (Figs. 2a, 2b, 3, 7a, 7b, and 9) that the device (200, 304a, 304b, 304c, 304d,

304e, 306, 700, 904a, 904b, 904c, 904d, 904e, 906) for generating a drift field has a structured drift electrode (206, 208, 306, 704, 712, 906) to generate the drift field between the drift electrode and the readout device (314, 914).

In regard to claim **10** which is dependent on claim 9, Danielsson *et al.* also disclose (column 6, lines 24-56) that the first and second conductive layers have a layer thickness of 5 μm (*i.e.*, from 0.1 μm to 20 μm) and the insulator layer has a layer thickness of 50 μm (*i.e.*, from 10 μm to 500 μm). The detector of Danielsson *et al.* lacks that the neutron converter layer has a 0.5 μm and 3 μm layer thickness. However, neutron converter layers are well known in the art. For example, Gleason teaches (column 1, lines 9-36) that a neutron converter layer comprises an absorptive coating of a material having a high neutron cross-section such as boron-10. In addition, Danielsson *et al.* further disclose (column 13, lines 9-11) that the detector can be optimized for detecting neutrons as is known in the art. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to optimize the thickness (*e.g.*, from 0.5 μm and 3 μm) of a boron-10 absorptive coating as the converter layer in the detector of Danielsson *et al.*, in order to detect neutrons with a desired efficiency.

In regard to claims **13** and **17**, the method steps are implicit for the modified apparatus of Danielsson *et al.* since the structure is the same as the appellant's apparatus of claims 1, 2, and 15.

In regard to claim **14** and **18**, the method steps are implicit for the modified apparatus of Danielsson *et al.* since the structure is the same as the appellant's apparatus of claims 1, 2, and 15.

<u>Issue B:</u> *Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Danielsson et al. (US 6,429,578) in view of Gleason (US 3,956,654) as applied to claim 2 above, and further in view of Sauli (US 6,011,265).*

In regard to claim **3** which is dependent on claim 2, while Danielsson *et al.* also disclose (column 7, lines 39-41) that the passages are aligned with the holes in the GEM structure, the modified detector of Danielsson *et al.* lacks an explicit description that the passages have a minimum diameter of between 10 μm and 1000 μm, and a minimum spacing of 10 μm to 500 μm. Since Danielsson *et al.* do not disclose the dimensions of the GEM, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified dimensions of Danielsson *et al.* as any one of the known conventional dimensions of GEM that would not require further description. Further, Sauli teaches (Fig. 4f; Tables 1 and 3) that a GEM structure have diameters D of for example, 110 μm and 130 μm, and a minimum spacing P of 140 μm to 200 μm. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide passages in the modified detector of Danielsson *et al.* having a minimum diameter of between 10 μm and 1000 μm, and a minimum spacing of 10 μm to 500 μm, in order to align the passages to the holes in the known GEM structure.

(10) Response to Argument

<u>Issue A (arguments on pp. 5-9 of appeal brief filed 16 July 2007):</u>

Appellant argues (last paragraph on pg. 5 to second paragraph on pg. 6 of appeal brief filed 16 July 2007) that Danielsson *et al.* do not allow a choice of a material for the converter because Danielsson *et al.* is always limited to the electrode being used simultaneously as a converter. Examiner respectfully disagrees. Danielsson *et al.* teach (dependent claim 11) embodiments wherein at least one of the electrodes acts as a converter. However, Danielsson *et al.* also teach (dependent claim 5) that "wherein said converter comprises a sheet of a material with an average atomic number sufficiently large that a fraction greater than 1% of incident X-rays are converted" and (column 13, lines 9-11) that "It is also to be understood that the detector may be optimized by a skilled man for other types of particles, such as neutrons, protons, atomic nuclei of various kinds etc". Therefore, Danielsson *et al.* is not always limited to the electrode being used simultaneously as a converter. On the contrary, Danielsson *et al.* expressly teach that the material for the converter should be chosen so as to optimize the detector for x-rays <u>or</u> a desired particle.

Appellant argues (third paragraph on pg. 6 to second paragraph on pg. 7 of appeal brief filed 16 July 2007) that a greater absorption efficiency is achieved with the claimed invention as compared to Danielsson *et al.* is supported by the declaration under 37 CFR 1.132 filed 8 May 2006. Examiner respectfully disagrees. The declaration under 37 CFR 1.132 filed 8 May 2006 is insufficient to overcome the rejection of amended claims based upon Danielsson *et al.* as set forth in the Office action because the evidence relied upon should establish that the differences in results

are in fact unexpected and unobvious and of both statistical and practical significance (MPEP § 716.02(b)). First it is noted that the evidence provided in the declaration is a computer simulation based on unstated models and parameters. Thus it is unclear that differences in the computer simulation results of absorption efficiencies necessarily predict a statistically significant difference in actual conversion performance. In addition, the declaration provides a comparison between a second computer simulation of GEM-foil coated with 5 µm copper on top with a third computer simulation of GEM-foil coated with 5 µm gold on top. The inventor also offers the opinion that the magnitude of the enhanced absorption efficiency of the third simulation was greater than the inventor would have expected. However, it should be noted that copper has an atomic number of 29 whereas gold has an atomic number of 79. Further, Danielsson *et al.* state (column 1, lines 53-57) that "The converter is usually made as a thin plate of some heavy metal like copper or iron, but molybdenum, chromiun or tungsten are equally suitable. In principle any material could be used, but the efficiency of the device will increase with increasing atomic number". Thus, Danielsson *et al.* expressly teach an increase in device efficiency is to expected when the atomic number is increased (*e.g.*, from 29 to 79). Therefore, the evidence relied upon did not establish that the differences in results are in fact unexpected and unobvious and of both statistical and practical significance.

Appellant argues (third paragraph on pg. 7 to second paragraph on pg. 8 of appeal brief filed 16 July 2007) that modifying the Danielsson *et al.* Fig. 3 embodiment by arranging an additional converter layer on the GEM foil is not suggested anywhere in the cited prior art. Examiner respectfully disagrees. US 6,429,578 dependent claim 18

expressly recites that "wherein said converter and said amplifier are integrated into one composite layered structure, such that at least one of said layers in said amplifier constitutes said converter". Note that claim 18 have a different scope from claim 11 (*i.e.*, at least electrode being used simultaneously as a converter), claim 13 (*i.e.*, central metal layer 708 in Fig. 7a), and claim 16 (*i.e.*, insulator being used simultaneously as a converter). Thus Danielsson *et al.* suggest that any layer can constitute the converter. That is, the invention of Danielsson *et al.* includes embodiments wherein the converter layer can be positioned as an interior layer or the outermost layer of the integrated converter amplifier. Danielsson *et al.* also disclose (column 13, lines 9-11) that "It is also to be understood that the detector may be optimized by a skilled man for other types of particles, such as neutrons, protons, atomic nuclei of various kinds etc". Further, Gleason teaches (column 1, lines 9-36) that boron-10 is a widely used converter layer for detecting neutrons. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to integrate a boron-10 layer onto the copper conductive layer in the detector of Danielsson *et al.*, in order to detect neutrons.

Appellant argues (last paragraph on pg. 8 to third paragraph on pg. 9 of appeal brief filed 16 July 2007) that the skilled artisan would not arrange such a boron layer to be the outermost layer of the GEM rather the skilled artisan would make the middle insulating layer from a converter material such as boron. Examiner respectfully disagrees. As discussed above, the invention of Danielsson *et al.* includes embodiments wherein the converter layer can be positioned as an interior layer or the outermost layer of the integrated converter amplifier. Danielsson *et al.* also disclose

(column 13, lines 9-11) that "It is also to be understood that the detector may be optimized by a skilled man for other types of particles, such as neutrons, protons, atomic nuclei of various kinds etc". Further, Gleason teaches (column 1, lines 9-36) that boron-10 is a widely used converter layer for detecting neutrons. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to integrate a boron-10 layer onto the copper conductive layer in the detector of Danielsson *et al.*, in order to detect neutrons.

Issue B (arguments on pp. 9-12 of appeal brief filed 16 July 2007):

In response to appellant's argument (last paragraph on pg. 9 to fifth paragraph on pg. 12 of appeal brief filed 16 July 2007) that the references fail to show certain features of appellant's invention, it is noted that the features upon which appellant relies (*i.e.*, a photocathode as a converter layer) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). In this case, the combination of Danielsson *et al.* and Gleason teach or suggest a boron-10 layer on the copper conductive layer of each integrated converter amplifier, in order to detect neutrons. It is important to recognize that a boron-10 layer is not a photocathode. Thus, arguments based on a photocathode as the converter layer is irrelevant to a boron-10 layer as the converter layer. Moreover, Danielsson *et al.* disclose (column 7, lines 39-41) that the passages are aligned with the holes in the GEM structure. Since Danielsson *et al.* do not disclose the dimensions of the GEM, one having ordinary skill in the art at the time of the invention would

reasonably interpret the unspecified dimensions of Danielsson *et al.* as any one of the known conventional dimensions of GEM that would not require further description. Further, Sauli teaches (Fig. 4f; Tables 1 and 3) that a GEM structure have diameters D of for example, 110 μm and 130 μm, and a minimum spacing P of 140 μm to 200 μm. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide passages in the modified detector of Danielsson *et al.* having a minimum diameter of between 10 μm and 1000 μm, and a minimum spacing of 10 μm to 500 μm, in order to align the passages to the holes in the known GEM structure.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

SL
22 October 2007

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